of this at great heights the denser gases could only occur as a very small percentage and the lighter constituents, of which hydrogen is the most generally known, must gradually begin to predominate. The convection currents alter this state of things only so far as the lower atmosphere (the troposphere) is concerned. Above 10 or 11 kilometers (at least in the Temperate Zone) little convection occurs, and above this level the change of composition is expected to begin. Also above that same level the fall of temperature with height ceases. As the velocity of sound in hydrogen is much greater than that in nitrogen or oxygen, it follows from this that at very great heights the velocity of sound increases so much that the sound rays are curved toward the earth.

In the light of these two competing theories the present author considers the following eight cases which have occurred during the present war: (1) Bombardment of Antwerp, October 7–9, 1914; (2) naval battle on the North Sea, October 17; (3) bombardment of German positions on the Yser by British naval guns, October 18; (4) heavy fighting on the line Ostend-Nieuport-Ypres, October 22; (5) heavy fighting at the Yser Canal, east of Ypres and south of Lille; (6) bombardment of German artillery in Flanders by 12-inch British naval guns, October 28; (7) severe attack of Germans on Ypres, British naval guns in action, heavy fighting at Dixmuiden, on the Lys, and at Messines; (8) naval battle on the North Sea, January 24, 1915. These cases are illustrated by maps and an elaborate table of the meteorological conditions at the times in question. Reviewing these cases, the author notes that the silent region is often displayed, and in the siege of Antwerp in an extraordinarily regular form.

Of the two explanatory theories put forward, the influence of variations of wind and temperature with height leads us to expect an asymmetry with respect to the source of sound and a difference between two mutually perpendicular directions, and permits of all kinds of distances. The physical explanation, on the other hand, requires complete symmetry with respect to the source of sound. It is found that the outer limit of the silent region is only slightly changed by considerable irregularities in the distribution of wind or temperature.

Probably many of the cases observed are explicable on the meteorological theory, although there is not absolute proof of this. In favor of the physical theory it must be noted that the border of the silent region has been always at about 160 kilometers from the probable source of sound and that no appreciable deviations from the circular form have been found.—*E. H. B[arton]*.

SPONTANEOUS IONIZATION OF THE AQUEOUS VAPOR OF THE ATMOSPHERE. II.[4]

By G. ODDO.

[*Reprinted from* Science Abstracts, Sect. A, Apr. 25, 1916, §460.]

The author discusses the various views which have been expressed concerning the origin of atmospheric electricity, this being connected largely, if not entirely, with the presence of water vapor. The molecules of the latter, being in a rarified or diluted state, undergo spontaneous ionization in the same way as do electrolytes in dilute aqueous solution; the ionized aqueous vapor of the atmosphere acts, therefore, as a conductor of the second class. In comparison with this source of ions, all other sources, such as the actions of ultra-violet radiation from the sun and of terrestrial radioactive substances, etc., must be regarded as subsidiary.

From the specific humidity of the air, the number of molecules contained in one gram-molecule of a gas, and the number of ions formed from 100 molecules of water at different temperatures, the ionic concentration is calculated for various temperatures and pressures. Fall of temperature diminishes the proportion of water vapor in the air, but starting from 32°C. increases its degree of ionisation. The calculations now made show that the ionic concentration, C_1, is highest and approximately constant between 5° and 20°; it remains high even at −10°C., but diminishes rapidly between −10° and −20°, in spite of the rapid increase in the degree of ionization; it is also high at 25°, decreasing rapidly at higher temperatures and becoming virtually zero at 32°. With varying pressure the ionic concentration changes nearly in accordance with Boyle's law, $p \times C_1 = K$. It will be seen that the ionic concentration of the atmosphere is at its maximum for those conditions of temperature which are most suitable to animal and vegetable life, and it may be assumed that the latter constitutes a true indicator of this ionic concentration.

At 15° and a pressure of 760 millimeters, 1 kilogram of moist air, occupying 773.4 liters at 0° and 760 millimeters in the dry state, contains 89×10^{-20} hydrogen and hydroxyl ions, and such marked ionization would lead to the supposition that many processes of oxidation and reduction, occurring in contact with air, are electrolytic in character. A number of natural processes of the inorganic, vegetable, and animal kingdom are discussed on these lines.—*T. H. P[ope.]*

VARIATION OF EMANATION CONTENT OF SPRINGS.[5]

By R. R. RAMSEY.

[*Reprinted from* Science Abstracts, Sect. A, Apr. 25, 1916, §451.]

An examination of the variation of the emanation content of certain springs shows roughly that an increase coincides with a season of rain and a decrease with dry weather.—*A. B. W[ood.]*

PLANETARY PHENOMENA AND SOLAR ACTIVITY.[6]

By T. KÖHL.

[*Reprinted from* Science Abstracts, Sect. A, Mar. 25, 1916, §297.]

Jupiter's northern cloud belts appear to be specially weak at times of sun-spot maxima and become broader and more conspicuous during minima. The secondary light on the dark side of Venus is mentioned in relation to the occurrence of auroral displays on the earth.—*C. P. B[utler.]*

FREE-AIR DATA BY MEANS OF SOUNDING BALLOONS, FORT OMAHA, NEBR., JULY, 1914.

WILLIAM R. BLAIR, Professor of Meteorology in charge.

[Dated: Aerological Investigations, Weather Bureau, Washington, Mar. 10, 1916.]

The primary purpose of this series of observations was the study of the diurnal variation of the different meteorological elements observed at the higher levels. Our observation of this variation[1] had heretofore been by

[4] Gazz., Soc. chim. Ital., 1915, 1, 45: 395–412.

[5] Proc., Indiana acad. sci., 1914, p. 489.

[6] Astron. Nachr. No. 4821. *Abstracted* in Nature, Jan. 6, 1916, 96: 521.

[1] The diurnal system of convection, Bulletin of the Mount Weather Observatory, 1914, 6, part 5, pp. 221–252.